PATENT SPECIFICATION (11) 1 412 077

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(21) Application No. 19333/73 (22) Filed 24 April 1973
(44) Complete Specification published 29 Oct. 1975
(51) INT CL² A61C 5/08
(52) Index at acceptance A5R 75B

(19)

(54) JACKETED DENTAL ANCHOR AND A METHOD OF MANUFACTURING SUCH AN ANCHOR

(71) I, BERNARD WIESSMAN, of 236 Fifth Avenue, New York, United States of America, a citizen of the United States of America, do hereby declare the invention,

for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a jacketed dental anchor for a tooth and to a method of manufacturing such an anchor.

Pins in dental work are used mainly for the retention and reinforcing of dental support structure. In this work a channel is, or a plurality of channels are, drilled in the dentin of a tooth. A dental pin is then placed into each of these channels. The dental pin is retained in the channel by conventional means, such as by screwing the pin into the channel using a self-threading pin, or by forcing the pin into friction locking engagement with the walls of the channel.

According to one aspect of the invention there is provided a jacketed dental anchor for a tooth, said anchor comprising an elongate reinforcing core and an elongate jacket enclosing the core against contact with the tooth, the jacket having an intermediate anchoring portion disposed between opposite end portions of the jacket, the core extending longitudinally through the jacket, one end portion of the jacket being resilient or being provided with a resilient head, said core including within the jacket a displacement resisting part including a portion of non-circular cross-section to restrain relative rotation between the jacket and the core and portions of different cross-sections to restrain relative axial movement between the jacket and the core, so that said core maintains said opposite end portions of the jacket in fixed relationship with respect to one another.

According to another aspect of the invention there is provided a method of manufacturing a dental anchor as defined in the preceding paragraph of this specification, said method including the steps of forming said elongate reinforcing core with said displacement resisting part as defined above and with an extension connected to the remainder of the core by a reduced cross-section weakened portion, surrounding both said displacement resistant part and said weakened portion with said jacket such that a portion of said extension projects axially outwardly of said jacket and rotating said projecting portion relative to the jacket to sever the extension at said weakened portion to leave the remainder of said core including said displacement resisting part, within said jacket.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawings, in which:—

FIGURE 1 illustrates an elevational cross-sectional view of a tooth with the dentition thereof excavated prior to building a superstructure thereon and the step of providing pin channel therein pursuant to the present invention;

FIGURE 2 illustrates a cross-sectional view of an excavated tooth having an exposed surface from which extends a pair of dental anchoring pins according to the present invention;

FIGURE 3 illustrates a cross-sectional view similar to that of FIGURE 2 of an excavated tooth upon which is mounted a superstructure through the intermediary of the anchoring pins according to the present invention;

FIGURE 4 illustrates a general view of the anchoring pin prior to the general last stage of manufacturing the latter;

FIGURE 5 illustrates a view partially in cross-section taken along the line A—A of FIGURE 4;

FIGURE 6 illustrates a partly cross-

sectional view of a further embodiment of the invention taken along the line A—A of FIGURE 4;

FIGURE 7 illustrates generally the very last stage of manufacturing a dental pin, partly in cross-section of a further embodiment pursuant to the present invention;

FIGURE 8 illustrates partly in cross-section a portion of a further embodiment of the anchoring pin prior to the general last step of manufacturing thereof pursuant to the present invention;

FIGURES 9 and 10 illustrate generally and in cross-section, respectively, a resilient plug utilized according to the present invention;

FIGURE 11 is a similar view to Figure 8 but showing the portion of the anchoring pin subsequently to said last step with a resilient plug assembled to such portion;

FIGURE 12 illustrates the remaining portion of the anchoring pin of FIGURE 11;

FIGURE 13 illustrates, a cross-section taken along line B—B in FIGURE 11; and

FIGURE 14 illustrates a modification of the cross-section shown in FIGURE 13.

Referring to the drawings, FIGURE 1 illustrates a tooth 20 disposed in the gingiva or soft tissue 22 (shown in phantom) of the human gum. As is well known, the body 24 of the tooth 20 is formed of dentin which encloses a pulp material 26 therein. The dentin 24 which projects from the gingiva 32 into the human mouth, is covered by a layer 28 of enamel (shown in phantom). In order to prepare the tooth for building thereon a superstructure 29, as shown in FIGURE 3 in phantom, a portion of the enamel and adjacent portion of the dentin is excavated to remove the decay and underminded tooth structure so as to provide an exposed outer excavated surface 32 with the decay removed therefrom. Any required root canal work may be accomplished at this time.

The first step pursuant to the present invention, is to provide an aperture, channel or cavity 30, or a plurality thereof, extending into the dentin 24 from the uncovered excavated surface 32, the channels 30 preferably being non-parallel. For this purpose, a conventional spiral or twist drill 34 is urged into the dentin 24, in a conventional manner, through the surface 32. The number of non-parallel channels 30 will depend upon the size and depth of the excavation. It will be noted that the various channels 30 have been drilled so as not to enter the pulp material 26, the channels 30 being directed away from the pulp material. The channels 30 thus formed have a conical bottom portion 38, as shown in the drawings.

Each of the channels 30 is to receive a reinforcing or anchor pin or rod 40. The dental pins 40 are formed preferably with an elongate stainless steel core and a ceramic or elastomeric jacket as will be discussed below.

As illustrated in FIGURE 4, the dental anchoring pin, designated by the reference character 40, is shown in its last stage of manufacture, the manufacturing process briefly being disclosed below. The anchoring pin 40 includes a manufacturing mounting extension 42 and a threaded anchoring body 44.

In the embodiments illustrated in FIGURES 5—7, the anchoring pin 40 is provided with an elongate metallic reinforcing core 46 internally of an elastomeric or resilient jacket 48 and terminating in a conical end portion 50 adjoining the extension 42 and an opposite end portion or manipulating means 52 remote from the extension 42.

The metallic reinforcing core 46 is provided with a pair of axially spaced portions 54 of reduced thickness for preventing axial displacement of the core 46 relative to the jacket 48.

The metal reinforcing core 46 terminates in a smooth conical end 56 and is integrally joined with a smooth conical end 58 of the extension 42 on a common plane of minimum diameter 59, the purpose of which will be further discussed below.

When manufacturing the dental anchoring pin 40, pursuant to the present invention, the core 46 is integrally formed with the extension 42. Generally speaking, the extension 42 is fixedly positioned in a mounting device, not shown in the drawings, such that the core 46 is exposed to permit the disposition or molding thereabout of the elastomeric jacket 48. The jacket 48 is formed such that the end portion 50 thereof is generally conical and terminates to surround or enclose the mutually adjoining conical ends 56 and 58 of the core 46 and the extension 42 respectively. The jacket 48 is constituted generally of elastomeric material. As indicated above, the embodiments of FIGURES 5—7 illustrate generally the last stage of manufacturing the dental pin 40. In this respect, the last stage of manufacture is effected by rotating the extension 42 relative to the jacket 48 to thereby sever the smooth conical end 58 of the extension 42 from the conical end 56 of the core 46. Generally, when rotating the extension 42, relative to the jacket 48, the core 46 would tend to rotate also. However, in order to prevent rotation of the core 46 relative to the jacket 48 to permit severing of the extension 42, the core 46 is provided with a portion of non-circular cross-section which resists rotation in the jacket 48. In this respect, as illustrated in FIGURE 5, the

core 46 is shown generally as an undeformed element and may be provided with either a square cross-section or a rectangular cross-section, the sides of which act internally against the inner square or rectangular cross-section of the innermost walls of the jacket 48 in contact with the core. Similarly in FIGURE 6, there is illustrated that the core 46 may be provided with an undulating extent at rectangular cross-section to enhance resistance thereof against rotation relative to the jacket 48. Similarly also, as illustrated in FIGURE 7, the core 46 may be provided with a twisted extent to enhance the resistance against rotation thereof relative to the jacket 48.

As illustrated in FIGURE 7, there is effected the condition after the last stage of manufacture of the anchoring pin 40 in that the extension 42 has been severed from the core 46 thereby leaving in the jacket 48 an exposed, conical, smooth end portion 60 which envelops the common minimal diameter 59 between the extension 42 and the core 46. The common minimal diameter 59 defines the weakened-most portion and thus acts to define a predetermined severing location of the extension 42 relative to the core 46. Upon rotation of the extension 42 relative to the core 46 the extension 42 severs from the latter to leave intact the dental anchoring pin according to the present invention with its exposed smooth opening 60.

A further embodiment of the present invention is illustrated in FIGURES 8—14, one primary difference between this latter embodiment and the former embodiment aforementioned being that in the present embodiment the extension 42 is provided with a helically-threaded conical end 62 integrally connected to the conical end 56 of the core 46. The other primary difference is that in the latter present embodiment of FIGURES 8—14, the jacket 48 is constituted generally of ceramic or porcelain material throughout the extent thereof.

The conical ceramic end 50 of the embodiments in FIGURES 8 to 14 must be provided with a resilient terminal abutment. This is achieved by rotating the extension 42 relative to the core 46 such that the helically threaded conical end 62 of the extension 42 severs from the conical end 56 of the core 46 at the weakened-most portion of minimal diameter 59 to leave an exposed conically threaded opening 63. A resilient or elastomeric plug 64 having a resilient abutment head 66 and a threaded conical projection 68 extending from the head 66 is threadedly seated in tight flush relation internally of the conical threaded opening 63 in the ceramic jacket 48.

Similarly as discussed above, for the embodiments of the resilient jacket 48 in FIGURES 5 to 7, the cross-section of the core 46 in the embodiments of FIGURES 8 to 14 may be square or rectangular as illustrated in FIGURES 13 to 14 respectively, and may be undeformed, of undulating extent, or of twisted extent.

As discussed above, it is vitally important when inserting a dental anchoring pin into the exposed excavated surface of a tooth that there be minimal lateral and longitudinal stress exerted against the walls of the pre-drilled dental pin channels. This is vital in order to prevent immediate or gradual breakage or collapsing of the tooth. The embodiments illustrated, obviate this possibility by providing an anchoring pin with at least a resilient end which minimizes pressure against the walls of the pre-drilled pin channels as the dental pin is threadedly deposited therein. Furthermore, the dental pin is sufficiently rigid and stable since the inner core thereof is metallic and is thus fully reinforced.

As the dental pin is threadedly seated into the pre-drilled pin channel in the tooth, the elastomeric or ceramic nature of that portion of the pin which laterally contacts the tooth is designed to be deformable before tooth deformation so as to prevent lateral breakage of the tooth. Furthermore, the end of the dental anchor, which is fully elastomeric and resilient in each of the embodiments of the present invention, contacts the base portion of the pre-drilled pin channel and permits tight-fastening of the pin therein since the fully resilient end deforms thus minimizing axial or longitudinal overstressing of the pin channel in the tooth.

It is noteworthy that the jacket 48, whether elastomeric or ceramic, is of a colour similar to that of natural teeth. Moreover, the jacket 48, which encapsulates the metallic core 46, acts to prevent discoloration of both the metallic core 46 and the tooth itself which latter would otherwise be in contact with the core 46 in the absence of the jacket 48.

Furthermore, in the case of the elastomeric jacket 48, which is entirely resilient, both the metallic core 46 which is itself somewhat deformably constituted and the elastomeric jacket 48 may be selectively bent together to conform to the contour of the tooth as may be necessary when anchoring the dental pin therein.

WHAT I CLAIM IS:—

1. A jacketed dental anchor for a tooth, said anchor comprising an elongate reinforcing core and an elongate jacket enclosing the core against contact with the tooth, the jacket having an intermediate anchoring portion disposed between opposite end portions of the jacket, the core extending longitudinally through the jacket,

one end portion of the jacket being resilient or being provided with a resilient head, said core including within the jacket a displacement resisting part including a portion of non-circular cross-section to restrain relative rotation between the jacket and the core and portions of different cross-sections to restrain relative axial movement between the jacket and the core, so that said core maintains said opposite end portions of the jacket in fixed relationship with respect to one another.

2. A dental anchor as claimed in claim 1, wherein the other end portion of the jacket constitutes a manipulating portion in which said core terminates at one end, said manipulating portion fully enclosing the portion of the core therein.

3. A dental anchor as claimed in claim 1 or 2, wherein said jacket is elastomeric throughout the extent thereof, said one end portion of the jacket having an axial recess.

4. A dental anchor as claimed in claim 1, wherein said jacket is made of ceramic material throughout the extent thereof, said one end portion of said jacket including a screw threaded socket in which is received said resilient head, said resilient head including an abutment portion at least partially surrounding said one end portion of said jacket and a projection having screw threads mating with those of said socket.

5. A dental anchor as claimed in any one of the preceding claims, wherein said anchoring portion of said jacket has helically extending threads.

6. A dental anchor as claimed in claim 1 or 2, wherein said reinforcing core is constituted of metal.

7. A dental anchor as claimed in claim 1, 2 or 6, wherein said non-circular cross-section portion of said core is of square cross-section.

8. A dental anchor as claimed in claim 1, 2 or 6, wherein said non-circular cross-section portion of said core is of rectangular cross-section.

9. A dental anchor as claimed in claim 1, 2 or 6, wherein said non-circular cross-section portion of said core has a continuously twisted extent.

10. A dental anchor as claimed in claim 1, 2 or 6, wherein said non-circular cross-section portion of said core has a continuously undulating extent.

11. A dental anchor as claimed in claim 1, 2 or 6, wherein said displacement resisting part of said core includes portions of equal reduced thickness spaced axially of the core and said core includes a conical end axially tapering towards, and terminating spaced from, said one end portion of said jacket.

12. A dental anchor as claimed in claim 4, wherein said socket is conical, the larger end of the socket being directed axially outwardly of said jacket, said projection being complementary with the socket.

13. A method of manufacturing a dental anchor as claimed in claim 1, including the steps of forming an elongate reinforcing core with a displacement resisting part as defined in claim 1 and with an extension connected to the remainder of the core by a reduced cross-section weakened portion, surrounding both said displacement resistant part and said weakened portion with a jacket having the features defined in claim 1, such that a portion of said extension projects axially outwardly of said jacket and rotating said projecting portion relative to the jacket to sever the extension at said weakened portion to leave the remainder of said core including said displacement resisting part, within said jacket.

14. A method as claimed in claim 13, including forming said weakened portion with two opposing conical segments constituting innermost and outermost segments relative to said jacket and being integrally connected on a common plane of minimum diameter located at said one end portion of said jacket.

15. A method as claimed in claim 14, including forming the outermost segment with helically extending threads and so rotating said projecting portions as to leave an exposed conically threaded opening in the jacket.

16. A method as claimed in claim 15, including forming a threaded plug of resilient material for insertion into, and threaded association with, the threaded end portion of the jacket.

17. A method as claimed in claim 13, including forming said jacket entirely of elastomeric material with helically extending external threads on the intermediate anchoring portion of the jacket.

18. A method as claimed in claim 16, including forming said jacket entirely of ceramic material with helically extending external threads on the intermediate anchoring portion of the jacket and providing said one end portion of said jacket with said resilient head.

19. A method as claimed in claim 13, including forming the non-circular cross-section portion of said displacement resisting part of metallic material of square cross-section.

20. A method as claimed in claim 13, including forming the non-circular cross-section portion of said displacement resisting part of metallic material of rectangular cross-section.

21. A method as claimed in claim 13, including forming the non-circular cross-section portion of said displacement resisting part with a continuously twisted extent.

22. A method as claimed in claim 13 or 20, including forming the non-circular cross-section portion of said displacement resisting part with a continuously undulating extent.

23. A dental anchor substantially as herein described with reference to, and as illustrated in Figures 2 to 5 of the accompanying drawings.

24. A dental anchor substantially as herein described with reference to, and as illustrated in Figure 6 of the accompanying drawings.

25. A dental anchor substantially as herein described with reference to, and as illustrated in Figure 7 of the accompanying drawings.

26. A dental anchor substantially as herein described with reference to, and as illustrated in Figures 8 and 11 to 13 of the accompanying drawings.

27. A dental anchor substantially as herein described with reference to, and as illustrated in Figures 8 and 11 to 13 of the accompanying drawings, when modified substantially as herein described with reference to, and as illustrated in Figures 9 and 10 and/or Figure 14 of the accompanying drawings.

28. A method of manufacturing a dental anchor substantially as herein described with reference to, and as illustrated in Figures 2 to 5 of the accompanying drawings.

29. A method of manufacturing a dental anchor substantially as herein described with reference to, and as illustrated in Figure 6 of the accompanying drawings.

30. A method of manufacturing a dental anchor substantially as herein described with reference to, and as illustrated in Figure 7 of the accompanying drawings.

31. A method of manufacturing a dental anchor substantially as herein described with reference to, and as illustrated in Figures 8 and 11 to 13 of the accompanying drawings.

32. A method as claimed in claim 31 when modified substantially as herein described with reference to, and as illustrated in Figures 9 and 10 of the accompanying drawings.

33. A method as claimed in claim 31 or 32, when modified as herein described with reference to, and as illustrated in Figure 14 of the accompanying drawings.

FORESTER KETLEY & CO.,
Chartered Patent Agents,
Forrester House,
52 Bounds Green Road,
London N11 2EY
— and —
Rutland House,
Edmund Street,
Birmingham B3 2LD.
Agents for the Applicant.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1975.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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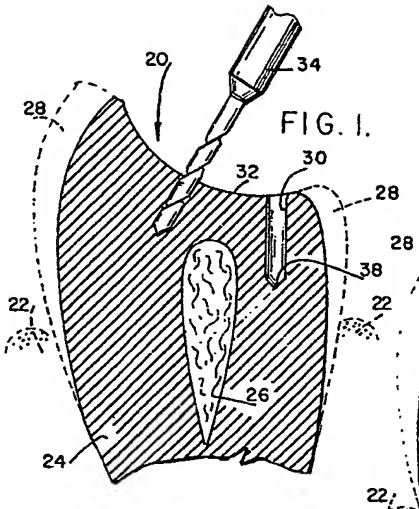


FIG. 1.

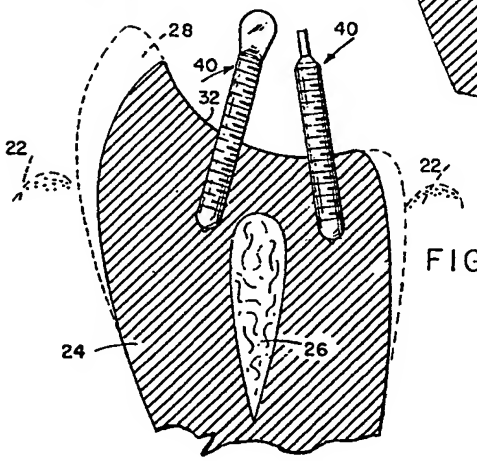


FIG. 2.

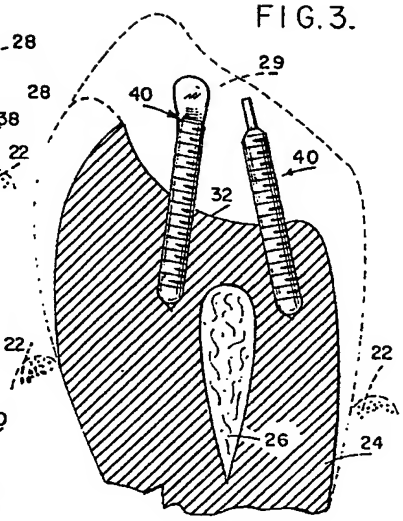


FIG. 3.

FIG. 4.

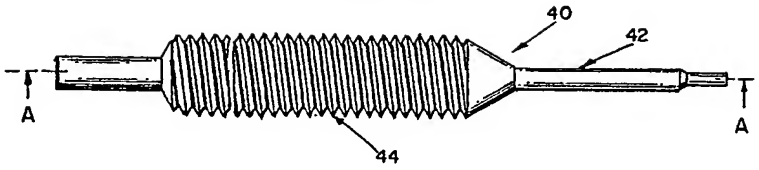
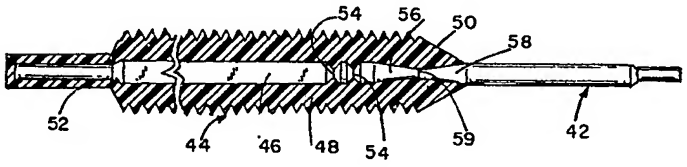


FIG. 5.



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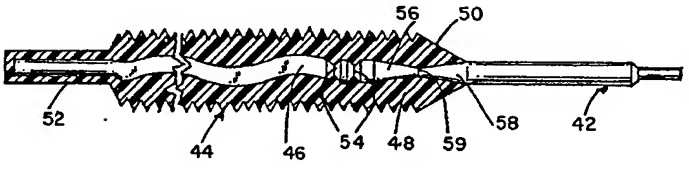

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

FIG. 7.

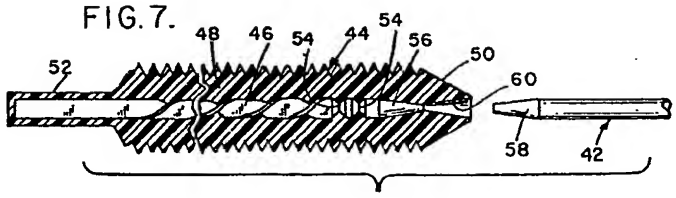


FIG. 8.

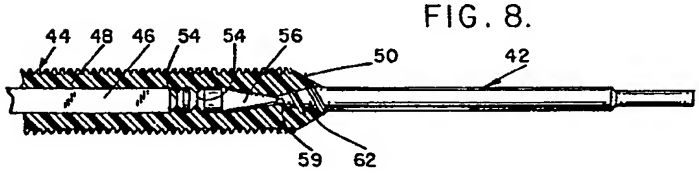
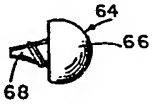


FIG. 9.



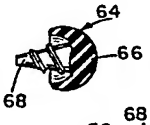


FIG. 10.

FIG. 11.

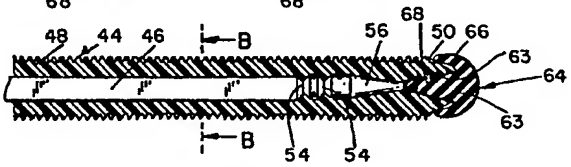
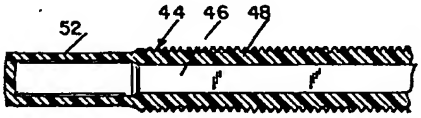


FIG. 12.



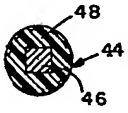


FIG. 13.

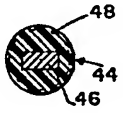


FIG. 14.